

## 18. Claims

1. The present invention relates to a wide band sound diffuser with self regulated low frequency, said apparatus wherein the main body of a diffuser assembly is comprising a hemisphere like shape (1) which is confined and intersecting an octagon truncated pyramid (2) which pyramid (2) is also intersecting on its four  
5 sides, respectively four symmetrical one quarter cylinder like shape (3) and the same octagon truncated pyramid (2) is intersecting other four symmetrical corners located shapes (4) which consists of a quarter hemisphere like shape embedded into a prism which each base prism is intersecting another lateral side of the central truncated pyramid (2) at the remaining four sides, the angles  
10 between all intersected shapes are the same, more than 90% of diffuser surface being convex therefore diffusing, wherein the said apparatus is also comprising two lateral rigid supports (5), glued or produced as one with the main body and positioned to the inside of the said diffuser which lateral supports are received, like a drawer, by two wooden rails (6), section "T" where the two wooden rails "T"  
15 are simply mounted on the wall or ceiling surface with screws or nails. The main diffuser body of the subject invention is composed from described three basically 3D shapes and four is the minimum number of apparatus to be mounted together (Fig. 10) at such a distances between each apparatus that a tight mechanical contact will result between the drivers (5) and the rails (6). Each four diffusers,  
20 at theirs nearest and common contact point displays together a new 3D complexes shape which consists of a sphere like shape embedded into a prism wherein each base prism is intersecting another lateral side of the central truncated pyramid (2) and the angle between each 3D shape, including the new common shape and his neighbour's shapes is the same, along the four created  
25 directions, like a cross, from the common point the one quarter cylinders like shape forms hemi cylinders like shape, all being absolutely symmetrical towards two perpendicular axes and respectively towards two diagonal axes. At the common point of each four apparatus a small inward decreasingly curvature is formed which serves to avoid central sphere reflections and optimize more local  
30 diffusion, also a small cross from four concave curvatures appearing on top of each shape (1). The wooden or made from any suitable material rails (6) may be steady mounted parallel or perpendicular to the ground or similarly on the ceiling, providing two lateral supporting surfaces for the grouped apparatus, on the remaining two sides which are not sealed relative to the supporting surface,  
35 the distance between their bottom side and the supporting surface being equal with wooden rails heights (6) and the air circulates freely in one direction on many parallel columns, the resulted parallel surfaces behaves like hard plates steady supported at the two longer edges. The empty space behind each diffuser follows their back geometry and the resulted geometry from the grouped diffuser  
40 forms a complex Helmholtz resonator, where the lower frequencies are related with the inside highest points of the diffusers main body relative to the supported wall but also to the biggest dimension of the grouped diffusers. Because at each grouped mounted diffusers of the subject invention, there are at least two columns of diffusers, in very tight contact, the air resonance behind each of them  
45 resonate at almost the same sound source spectral contents but not at the same

sound levels, the rooms 3D map of standing waves being continuously variable and follows their distribution according to the known physic laws. Comparing the Fletcher-Munson's loudness curves with the polar plots from Fig. 14,15,16,17, especially Fig. 18 a full range, with the polar plots from Fig.20 of a known foreign patent applications, we conclude that the apparatus of the subject invention belongs to a new diffuser category, the complete one, having linearity for the low frequency, the diffusing capability, "D" near to one, overall working like an inverse ultra fast automatic and signal adaptable wide range digital equalizer.

2. Wide band sound diffuser with self regulated low frequency, said apparatus according to claim 1 wherein the main body of a diffuser assembly is comprising a hemisphere like shape (1) which is confined and intersecting an octagon truncated pyramid (2) which pyramid (2) is also intersecting on its four sides, respectively four symmetrical one quarter cylinder like shape (3) and the same octagon truncated pyramid (2) is intersecting other four symmetrical comers located shapes (4) which consists of a quarter hemisphere like shape embedded into a prism which each base prism is intersecting another lateral side of the central truncated pyramid (2) at the remaining four sides, the angles between all intersected shapes are the same, the main diffuser body is accepting a base (11) from Fig. 6, also made from vacuum thermoformed plastics, with an area equal with the apparatus main body minus his wall thickness, having in each of his four corners one plastic cylindrical shape (10), well glued upon the base (11). At the respective points, located at the four edges of the main's apparatus body, below his surface, there where the shapes (4) are highest, are glued four cylindrical shapes (9) which because have a slightly different interior diameter from the cylindrical shape (10) clasps. The inside (9) and outside (10) surfaces of the said cylindrical shapes presents enough rough surface which corroborated with the tight contact between them (their relative diameters are almost alike) permits controlled movements. The springs (12), one for each assembly of shapes (9) and (10), are located inside the cylinders, between the base (11) and a limiter (8), and are mounted preloaded. The limiter (8) is parallel with the base (11) surface and allows a correct spring's function. The variable mechanical connection between the base (11) and the main apparatus body is provided by an endless screw (15), with his screw-nut (16) end. That's it the endless-screw spiral helped by (16) belongs to the base (11). The endless-screw's fixed part (13), is centred located between the lower sides of the central hemisphere (1) - where is glued, with his hole (17), positioned relative to the geometrical center of the base (11). The endless-screw and his fixed part (13) are made from any type of hard plastics. The endless-screw functioning is assured by a key with a cross like section, to be inserted trough the hole (17) coaxial into the endless-screw moving part at the point (18). His use is reduced to few but essential room tunings, sort of loudspeakers replacements or furniture's changing. More, Fig. 6 contains a different spring (14) and his normal function is secured and aligned by a thin plastic cylinder (20). The spring (14) provide a continuous loading between the diffuser's main body from Fig. 6 and his base (11). The force provided by the preloading of all four springs comers situated must be equal with the screw-nut's

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- spring and all springs does not permit any kind of vibrations of the suspended parts. When one diffuser from Fig. 6 is distanced from the base (11), all other diffusers from the grouped diffusers Fig. 6, are moved using the key to the same distance. The base (11) is mounted against the support surface of the wall or ceiling surface by screws from the three holes (19), in a triangle disposition for an easier alignment. As the technologies advances, the complex diffuser body and his articulated towards the endless screw base are fabricated from hard impact polystyrene or any material suitable for the device geometry using vacuum thermoforming, injection moulding, blow moulding facilities or any other suitable way, keeping exactly the same device geometry, the internal mechanism with all required supports being added with adhesives or produced from the same material as one piece with the diffuser device main body, the same for the base (11) which clasps matching the upper main body.
3. Wide band sound diffuser with self regulated low frequency, said apparatus according to claims 1 and 2 , where the preferred arrangement of assembled apparatus from the Fig. 6 incorporating an endless-screw hases the possibility of variable main body location relative to the base (11), thus permitting that the lower fundamental frequency resonance be around 30 Hz, or even as low as 1 Hz at the maximum distance of the main body relative to the base, simultaneously doing a clean diffusion at least for the standard 250-6300 Hz band, where the diffusing capability "D" tends to 1, number which is defining the ideal diffuser.